the eyes turned, as we generally do. But one empirical rule may be remembered that is very generally true. The eyes are turned to look toward the side on which the lesion occurred.

The variations in the size of the pupil are also to be noticed as assisting in localization.

Those cortical centres which have been most carefully mapped out are, perhaps, those whose disease produces the manifold forms of aphasia. At least five different centres are here concerned, situated in as many different parts of the cerebrum. The cortical centre for the auditory nerve, for instance, is situated in the temporal lobe, just above the ear. Total destruction of this centre would, of course, produce total deafness; but only such a part may be pressed upon that the condition of soul deafness arises. Noises and words are heard perfectly, but a word conveys to the mind no idea. The name of a thing is heard as a noise, but calls up no image of the thing itself. If you ask such a patient a question, you might as well have spoken in Choctaw as far as conveying any idea to his mind is concerned. Such a person may even retain his ability to speak, but can carry on no conversation with his friends, because the answers received mean nothing to him.

If, however, in such a person the occipital lobes should remain intact, communication with him may be opened up by means of writing. Written words convey a meaning to him, and he may answer a written question by the voice. Or the ability to write may be destroyed by an accident to that part of the cortex just behind the middle of the fissure of Rolando. Or that may occur which is perhaps most common—the ability to pronounce words may be wholly or partially lost, or the entire loss may be only partly recovered from. This centre is situated between the long and short arm of the fissure of Sylvius.

Not only may the centres themselves become diseased or injured, but the complicated system of nerve fibrillæ which binds them together, enabling them to work in harmony, may be disturbed in some part. If this should occur, for instance, to the fibres uniting the hearing centre to the motor centre for speech, while the centres themselves remained intact, then the patient could understand the spoken words or could express himself, but to repeat words that he had just heard would be impossible. The path between the point where the word is recognized and that where it is reproduced is destroyed. It is also very easy to see how impossible it is for all these complicated associations to be reformed in the right side of the brain if they are destroyed on the left after adult life has been attained.

The last speech centre to be mentioned is the most important of all. It is known as Broca's centre, situated in the inferior frontal convolution on the left side. Here the idea of speech seems to be located, however it may be expressed. Here the thought is clothed in words, and disturbance here is irremediable.

By the aid of the other symptoms which might be spoken of, such as the crossed paralysis originating in the pons, the vertigo from affection to the cerebellum, the mental hebetude and slow pulse that accompanies many cerebral growths, and so on, it will be acknowledged that the diagnosis and localization of intracranial lesions are becoming as certain as those of lesions in any other locality, although requiring, possibly, a little more time for study. It is from a consideration of these recent advances that we must admit that there is hope for cranial surgery, and that it has already a legitimate field.

Tincture of Aloes is suggested as an application to varicose ulcers.

CROOKES TUBES AND STATIC MACHINES.

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THE MEDICAL RECORD of November 28th reports the use of *x*-rays in detecting thoracic aneurism, and states, as evidence of the power of a Crookes tube: "The speaker had put a healthy young man, wearing all his clothes but his coat, between a tube of special construction and the fluoroscopic screen, and in twenty seconds he could clearly see not only the ribs, but the heart pulsating, and the latter was so distinct that it was possible to tell the ventricles from the auricles." Probably no physician who has read this paragraph has failed to recognize the possible value of such an aid to diagnosis, or to wish to procure an equally efficient tube for himself. There yet exists, however, great diversity in Crookes tubes. No standard size, shape, or degree of vacuum can be determined unless a standard current also has been decided upon. Each means of electrical excitation demands a different adaptation to itself of the size and shape of the tube, the size and relation of the electrodes, and the degree of vacuum. This has led to much misunderstanding, to many conflicting and unfounded statements by different writers, and to many disappointments on the part of buyers of tubes, suited, perhaps, to other methods of excitation, but ineffective in their own hands. In the paper on Roentgen's discovery which I read before the Kings County Medical Society on April 21st of this year, I then said: "A powerful static machine with Leyden jars and transformer coils will do fairly good work, but far from the best."

This opinion was shared by all the leading workers in the field at that time. It was based upon the tubes then made, but it is no longer true. Until June my own observation and experience continued to confirm my belief in the superiority of the coil apparatus I described in April. During the past four months, however, I have made a large number of experiments to determine the actual facts in regard to tubes and exciting apparatus for physicians' use, so that the physician who has a choice between therapeutic and non-therapeutic electrical apparatus may employ the one that will serve him best and profitably.

There is a general confusion of ideas among makers as to what constitutes a "high efficiency tube." Some are satisfied with a display of the bones of the hand. Very few makers or expert operators really know the full capabilities of a superb tube, for few have seen them developed. Common tubes of ordinary vacuum are now plentiful. They will glow with coils giving from two to six inch sparks, and gratify the wayfaring man, who is amazed to see his own bones; or they will produce negatives of even the trunk of the body in the course of time. These ordinary effects are of but insignificant value in diagnosis. Tubes suited to larger coils, giving ten to twelve inch sparks, may also easily be obtained. Double-focus tubes and alternating currents are also available, and are often regarded as exceptionally efficient. When these tubes are purchased by physicians who have static machines and have read that they can be used to produce *x*-ray effects, the result is almost invariably disappointing.

To explain why this is so, and to enable medical users of Crookes tubes to employ their own apparatus successfully, are the objects of this paper.

When the bulb of a tube is of a proper convexity, it will throw rays upon a screen held at many feet—ten or even twenty—from the tube itself. Such a rounded convexity is required to make fluoroscopic examinations through thick bodies, for if the bulb is acutely oval the rays will quickly converge and the maximum of efficiency fades at once within a very few inches of the tube. If the internal electrodes are too far apart or too near together, they impair the effect. The space between them best suited to the large Holtz machine is three inches, with a margin of one-half inch either way, according to the size of the tube. Very small or large tubes are unsuited to static machines, as a rule, although the construction and vacuum may be so well adapted to this current as to make exceptions of special tubes. Medium sizes have been the best that I have seen.

When the external terminals of a tube are connected directly to the prime conductors of a Holtz machine, we have an immediate and infallible test of the vacuum. What the correct vacuum should be cannot be stated in terms of fractions of an atmosphere, but the demonstration of its degree is as absolute as mathematics. If it is a very low vacuum, the electrical discharge will pass in a bluish stream between the electrodes, and no luminosity will glow in the tube. If it is a little higher vacuum, the visible blue stream will disappear, and in proportion as the vacuum rises the green glow will increase in brightness. At the same time the spark stream between the prime conductors is also indicating the vacuum to be very low, or some degree between very low and very high.

A current will pass through conductors in the direction of least resistance. If the vacuum is low its resistance may be so small that it may equal only a small fraction of an inch of air gap. A vacuum so high that a six-inch spark coil will send nothing through it, may demonstrate no more than a one-half-inch spark stream between static poles. A suitably high vacuum should force back by its resistance at least one and one-half to two inches of spark stream. The green glow in the tube will then be exceedingly bright, and *x*-rays can be developed of very high efficiency. No tube that does not furnish this demonstration is adapted to large static machines, and if physicians will ascertain the facts before buying tubes they can avoid both disappointment and expense.

The outer terminals of a proper static tube must be ten inches or more apart, and attachment to machine should be made with insulated wire of about No. 18 in size, as the fine wires so often employed sway too readily and leak off the current when the attraction of opposite polarities brings them near together.

I have kept a written history of the behavior of twenty-six tubes, tested in recent months, in my office. A tube of lower vacuum than it should possess for convective discharge excitation, will produce efficient *x*-rays when the oscillating static current is used with small Leyden jars. The maximum of steadiness and radiance can be found by short-circuiting the poles and then gradually drawing them several inches apart until the best effect is developed. The plates of the machine should revolve as rapidly as is consistent with safety. This method is open to objections. It is noisy and the oscillations try the eyes. It sets up some heat in the tube, but very little as compared with the street current. The convective method is preferable. When the vacuum is just right the terminals may be attached directly to the prime conductors of the static machine, without employing any jars, coil, or other device. Revolve the plates rapidly, and on drawing the poles apart the tube will instantly light up with the brilliant green phosphorescence so familiar now to all.

If the electrodes are in proper relation all the current will be focussed upon the anode, and the bulb will appear in twin diagonal hemispheres—one in eclipse and the other luminous as the sheen of a strong light. If, now, the hand is examined through the fluoroscope, the bones that were merely a black shadow with a tube of low efficiency will be nearly as white and transparent as the soft parts. The beautiful mechanism of the wrist-joint will appear in clear detail. A group of metallic objects on the back of a pine board will show through a book of sixteen hundred pages, or a heavy brass tray, such as I use for a foot plate with my static machine. When a tube does this, I know it is a good tube. By further arts of management, such as all tubes require, efficiency can be still further developed, and demonstrate the ribs, the spinal vertebræ, the movements of the heart, and all other effects so far attained by any operator with any means.

The tube does not overheat, and there is no apparent tax upon it or limit to the time it may be run at full power. It does not break down under strain, and it cannot be overloaded. The convective current makes no noise. The glow of the tube is as steadfast and unwavering as moonlight in an unclouded sky.

This economy in the durability of tubes is a factor of great importance beyond the first cost of the tube, for a tube that has proven its high worth and exceptional capacity is priceless. Money alone will not replace it if it is injured or broken. Moreover, none of the alleged injurious effects of *x*-rays, reported hastily and with more or less sensation, are caused by the static current. It seems wellnigh impossible that alopecia and dermatitis should be attributed to *x*-rays by practical medical observers; but as they have been so attributed and no one has, to my knowledge, pointed out the error of this view, the simple fact may here be stated that these electrical or heat effects, which resemble sunburn, result from the action of heavy currents operating large coils and are not due to *x*-rays. Roentgen's classical report contained the statement, "The rays have no calorific effects;" and I am not aware that any one has yet shown Roentgen to be mistaken.

The advantages of safety, facility, life of tube, comfort in operating, absence of heat effects, and stability of the radiance are among those afforded the physician by the static machine. The questions of cost and availability are also to be considered. When no tube was made that would operate well with the static machine, the coil was obligatory; but the large coil outfit cannot be used by the physician in medical practice and is a useless luxury when not producing *x*-rays. The superior value of an office or hospital equipment, costing no more than an approximately effective coil outfit and capable of a wide range of therapeutic uses, is self-evident. Such an equipment is to be found in the improved Holtz machines now made. This type of electrical apparatus can be operated by the surgeon, or general practitioner, or specialist far more readily than can galvanic or faradic batteries in their therapeutic work. Instruction in its management can as readily be procured as instruction in the use of any medical or surgical apparatus. But its double advantage of value to the physician in two fields instead of the single utility possessed by the Ruhmkorff or Tesla coil would not suffice to displace the coil if the latter was much the most effective in *x*-ray work. The time is nearly at hand when leading hospitals and physicians throughout the country will be deemed behind the age if they are not prepared to employ this aid to diagnosis. It is therefore important to point out the satisfactory fact that electro-therapeutic and the maximum of *x*-ray efficiency are obtainable with the same apparatus—to wit, the static machine. I am aware that nearly all the weight of authoritative utterance up to this date is against this conclusion. Nevertheless, I have never failed to demonstrate its accuracy since I have been able to procure tubes made partly after my own suggestions and adapted to the static apparatus. The whole matter lies in adapting the tube to the apparatus, and not the apparatus to the tube. When this is successfully done the demonstration of superior efficiency is complete.

I recently showed certain effects to an expert maker of Crookes tubes, and asked him what a coil would cost which would produce equal effects. His reply was emphatic that "no such coil could be bought at any price, not even for a thousand dollars." On another occasion another leading maker stood in open-eyed astonishment before a tube in my office, which was excited by my eight-plate thirty-inch Holtz machine. The plates were run at high speed by an electric motor, and the screen glowed as if striving to burst into incandescent light. He had seen the best effects produced in the laboratories of distinguished electricians, and he was an accurate judge of progressive advances in this field. He not only came to my office predisposed in favor of coils, but had been informed by world-renowned authorities that the static machine would break tubes and was inferior to the poorest coil. Without a word of argument on my part, he gazed at the to him marvellous radiance so easily and instantly produced in his own tube, which his own coil would not excite at all, and made the following remark in a deliberately impressive manner: "I now see that the best way to excite a Crookes tube is with the static machine. No coil will equal it."

It is my belief that with a special static tube I can demonstrate the truth of this conclusion to every competent observer. I have never broken a single tube in any of my experimental work with this apparatus, although I have at various times employed in tests between forty and fifty tubes of different makes and construction. I have never discovered any of the injurious heat effects reported by those using street currents of large amperage, and my tubes operate for hours at about blood temperature. Some experimenters early abandoned the static machine in *x*-ray work and turned again to the coil; others have seen demonstrations of all methods by some of the best experts in this country, and have relegated the static current to second or third place. There are several hundred physicians to-day who would eagerly employ Roentgen's wonderful discovery by the aid of apparatus they already possess, if they were aware that it could be done. To a hospital the advantage of utilizing a therapeutic machine already among the essentials of its equipments is manifest, for few hospitals can afford additional and costly luxuries for diagnosis alone. Moreover, any coil or tube which will do less than show the heart beat, or fail to produce a good negative of the trunk of the body of an adult with an exposure of five minutes, does not possess the high efficiency the medical man requires.

But three things are needed to place this degree of efficiency in the hands of all who desire:

1. A Holtz machine of the therapeutic type and size, operated by a motor.
2. A Crookes tube specially adapted to this form of high potential current.
3. A practical knowledge of technique.

I am sure that this will be welcome information to many physicians who hesitate at the extra expense of a good coil. Of the accuracy of the statements here made I have had the most convincing proof during a sufficient period to remove the uncertainties of hasty judgment. I have demonstrated the facts both to physicians attending my clinic and to manufacturers who have been previously sceptical. I am prepared to maintain: 1st. That no method now known, however costly, will surpass the efficiency of the Holtz machine with tubes suited to it. 2d. That the Holtz machine and tubes adapted to its maximum discharge will readily and economically equal or surpass the best *x*-ray effects producible by any or all other means of electrical excitation with any design of tubes that can now be obtained. In the interest of medical and surgical institutions and practitioners desiring to utilize *x*-rays, these facts should be made known.

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THE TREATMENT OF GOUT.

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IN considering the treatment of gout, I shall confine myself to the methods of treatment, both medical and hygienic, which I have found to be of the greatest value in my own experience; and while in certain instances I may refer to those employed by other practitioners, but which I have not myself used, it will be simply to point out several methods of procedure which I believe may be of equal value. I do not wish to be understood as originating any special method or as making claims of superiority of treatment, but during the past ten years I have had the opportunity of seeing and treating a very much larger number of cases of gout than often falls to the lot of the general practitioner, and I have had during that time ample opportunity of trying many methods. I may be pardoned, then, for giving you briefly the result of my personal observations.

In order to facilitate the study of the subject, I shall consider the treatment under three heads, in the following order: 1. The treatment of the gouty diathesis. 2. The treatment of chronic gout. 3. The treatment of acute gout.

As will be readily understood, it is not possible to divide the subject in practice arbitrarily as I have done here, as many of the manifestations of the gouty diathesis may rightfully be considered phases of chronic gout, and exacerbations of chronic gout and an acute attack developing *de novo* are practically the same, so far as their treatment is concerned. For our purposes here, such a classification will undoubtedly aid us.

The Treatment of the Gouty Diathesis.—The treatment of the gouty diathesis may be subdivided into medicinal treatment and hygienic treatment. The use of drugs other than tonics and digestives in cases which are undoubtedly gouty, but in which none of the special manifestations of the disease exist, are of doubtful efficacy; in all these cases, however, the general condition of the system is, as a rule, below par, and there is always more or less anæmia.

In order to restore the general tone and to increase the standard of the red blood corpuscles, some form of iron, with or without the addition of arsenic and strychnine, is of undoubted service. In elderly subjects in whom the muscular system is markedly under tone, the addition of digitalis in small doses will be found of great value, not only through its specific effect upon the weakened heart muscle, but as an aid to the digestive power through the stimulation to the visceral circulation. The use of alkalies in large doses has never been of great value in my hands, and when used at all they must be used only in the robust. I know that many observers set great store by the use of these agents, and no less an authority than Burney Yeo maintains the efficacy of the alkaline treatment, in support of which he says:

> "In spite of all the theoretical denunciation of the use of the sodium salts in gout, the gouty from all parts of the world flock to those very continental springs in which these salts are most predominant."

While it is true, as Yeo says, that many gouty people visit those springs and undoubtedly derive great benefit from the use of the waters, the value of them, to my mind, lies not in the alkali which they contain, but in the large amount of water which the patients drink in order to get the alkali. This is also true of the